DOCUMENT RESUME

ED 220 412 SP 020 478

TITLE	Instructional Coding System for Mathematics Program of Studies. MET, A Title IV-C Project.
INSTITUTION	Fairfax County Public Schools, VA. Dept. of Instructional Services.
SPONS AGENCY	Virginia State Dept. of Education, Richmond. Office of Pilot Studies and Title IV-C Project.
PUB DATE	82
NOTE	54p.; For related documents, see SP 020 474-491.
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Behavioral Objectives; Classroom Techniques; County School Districts; Curriculum Guides; Educational Objectives; Elementary Education; *Elementary School Mathematics; Inservice Teacher Education; *Instructional Materials; Mathematics Materials; Pilot Projects; *Resource Units; *Student Evaluation
IDENTIFIERS	*Project MET

ABSTRACT

This document is part of the Management for Effective Teaching (MET) support kit, a pilot project designed by the Fairfax County (Virginia) Public Schools to assist elementary school teachers in planning, managing, and implementing the county's Program of Studies (POS). This document provides an alpha-numeric coding system to be used in conjunction with the "Math Correlation Chart" (SP 020 475) and the "Match of POS Test Items and Skills" (SP 020 484). Each code represents the curriculum area, grade level, strand or skill, and learning objectives in mathematics for kindergarten through sixth grade. Under each grade level, general goals are presented and supported by brief statements of objectives in specific skill areas. The skill areas included are: (1) exploration; (2) patterns; (3) sorting and classification; (4) numeration; (5) foundations for operations; (6) statistics and graphs; (7) geometry; (8) measurement; (9) money; (10) time; (11) estimation; and (12) word problems. (FG)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED220412

INSTRUCTIONAL CODING SYSTEM

for Mathematics Program of Studies

ATHENA PROJECT

1982

SP 020 478

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☑ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

MET

Management for Effective Teaching

We are happy to present the Project MET materials to you. As you know, these materials are copies of the original contents of the Management Support Kit. They are designed to assist teachers, streamline organization, and support current management efforts.

We hope that you find them useful. Should additional assistance be required, please feel free to contact us at Masonville.

Project MET Staff
Pat Harbour, Director

Office of Elementary Education
Department of Instructional Services
Fairfax County Public Schools • Fairfax, Virginia

Management for Effective Teaching

MET

MANAGEMENT SUPPORT KIT

Introduction

Project MET, Management for Effective Teaching, is a federally funded developmental project which will be piloted, with materials field-tested, in Fairfax County Public Schools, during the school year 1982-83. Materials and procedures have been developed to assist with the management of planning, teaching, and record keeping. MET products contained in the Management Support Kit are designed to aid teachers in the effective utilization of time, space, and materials in organizing and planning for instruction. Approximately 400 elementary teachers throughout the school system will use the products from the kit.

The teacher is a manager who plans, coordinates, and directs the classroom, an organizational unit of the school, and thus:

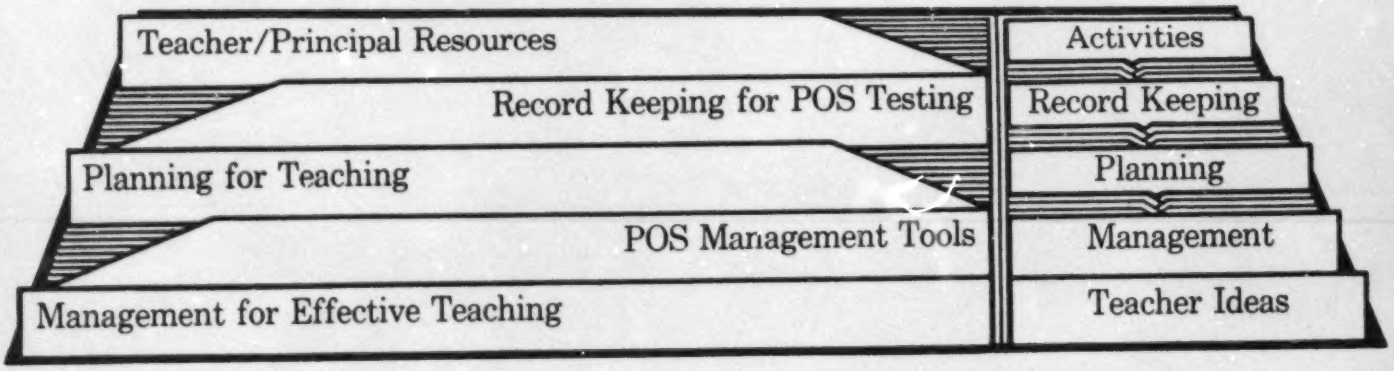
- sets goals and objectives
- ensures that appropriate knowledge and skill mastery levels are attained among students
- creates an environment conducive to the development of positive attitudes toward self and others
- teaches and reinforces positive individual and group behavior
- motivates students to achieve individual and group goals (cognitive, physical, and socio-emotional)
- manages the instructional materials, classroom space, and human resources for a quality learning environment

Research suggests that effective managment in teaching enhances the instructional program and ultimately may improve student achievement. The purpose of Project MET is to provide an opportunity for teachers to determine the extent to which this is true. Teachers will field-test the procedures, process models, and materials contained in the Management Support Kit.

During the 1982-83 school year, teachers will be asked to respond to a survey that assesses the contents of the kit. The survey will allow teachers to determine the utility and validity of the products. The participation and cooperation of each teacher using the kit and responding to the survey will be important to instructional management in Fairfax County Public Schools. Since the project is a pilot program, the results reported by teachers who have used the MET materials may have implications for instructional management throughout the state of Virginia. The time and energy of each participant will be greatly valued and appreciated.

MET

Management for Effective Teaching (MET) is a pilot project funded under Title IV-C of the Elementary and Secondary Education Act. The project was planned and implemented to answer the need expressed by teachers, principals and other educational personnel for resources to manage more effectively the Fairfax County Public Schools' Program of Studies.



What MET Is...

It is a management support kit of resources, materials and information designed to assist classroom teachers (K-6) in planning, managing and implementing the Fairfax County Public Schools' Program of Studies.

Approximately four hundred Fairfax County Public School teachers will field test and assess the products during the 1982-83 school year. The results from field testing the Management Support Kit will contribute to ideas for the development of a divisionwide instructional management system.

What MET Includes...

- a coding system for the mathematics Program of Studies
- a planning process for the first nine weeks of school, and daily/weekly and long-range models
- a record keeping system for the mathematics Program of Studies and accessment resources (Program of Studies tests) for managing the diagnostic prescriptive teaching process
- a chart which identifies and matches the Program of Studies items with specific mathematics skills
- a sample letter to parents to convey purposes of the Program of Studies testing and the manner in which to interpret test results
- a teacher plan book designed, piloted and revised by teachers
- a set of supplementary and adaptable teaching ideas
- a principal's checklist for opening and closing school

How MET Works...

It incorporates good management practice into the instructional program.

It organizes teaching strategies.

It coordinates teaching materials and diagnostic resources with the Program of Studies.

For Additional Information about Project MET
(Management for Effective Teaching), contact:

Patricia Moore Harbour, Ed.D.
Department of Instructional Services
3705 Crest Avenue
Annandale, VA 22003

CONTENTS

Title	Page
Preface	i
Introduction	ii
Coding System	iii
Purpose	iv
Mathematics, Kindergarten	1
Mathematics, Level 1	5
Mathematics, Level 2	10
Mathematics, Level 3	16
Mathematics, Level 4	23
Mathematics, Level 5	30
Mathematics, Level 6	36

PREFACE

The elementary mathematics program for Fairfax County Public Schools is based upon objectives. The objectives define a core program so that teachers can enrich the program according to the needs of each child. Further, the objectives state only final learning outcomes; and if an objective is given at one level, it is not repeated at a higher level unless it is extended to include larger or smaller numbers.

Equally important with final learning outcomes is the acquisition of a positive attitude toward mathematics and an understanding of patterns inherent in the structure of mathematics. This acquisition comes about when mathematics is approached through a spirit of inquiry.

The manner in which mathematics is taught should foster the spirit of inquiry. Through using objects and pictures, children build a strong conceptual understanding and a rich mathematics vocabulary; through responding to open-ended and thought-provoking questions, they search for patterns and relationships; through solving problems drawn from real-life situations, they apply mathematics to their lives; through estimating reasonable answers to problems and confirming their estimates, they gain confidence in their ability to solve problems.

When children approach mathematics through inquiry, they develop skills in critical thinking and in problem-solving. Mathematics offers a world of opportunities for the development of these skills. Nearly every objective in Program of Studies for mathematics lends itself to this development. When children successfully solve problems, they experience a delight, which, indeed develops within them a confidence in their own mathematical ability.

* In this field-test edition administrators and teachers are invited to make comments regarding the objectives and the levels at which the objectives are given.

Introduction

The Instructional Coding System (ICS) for the Mathematics Program of Studies is a management tool for classroom teachers. Each objective in the program of studies is assigned an alpha-numeric code. The code is composed of seven parts. Each symbol represents a specific element. Such as: The first symbol represents the curriculum - Math M; the second symbol identifies the grade level - 3rd grade 3; the third symbol is assigned to the specific strand - Numeration Nu; and, the last symbol specifies the objective number and letter - Objective one, a 01.A.

The code is written as follows:

M	3	N U	0 1 . A
Math	Grade	Strand	Objective number and letter

The mathematic strands are identified by a letter abbreviation. The following chart shows the assigned symbol and specifies the particular grade level where each strand is taught.

MET
Instructional Coding System
for
Mathematics Program of Studies

Code	Strand	Grade Levels						
		K	1	2	3	4	5	6
EX	Explorations	X						
	Patterns					X	X	X
PA	No. Patterns	X	X	X				
SC	Sorting & Classification	X						
NU	Numeration	X	X	X	X	X	X	X
OP	Foundations for Operations	X	X	X	X	X	X	X
	Operations							
ST	Statistics & Graphs	X	X	X	X	X	X	X
GE	Geometry	X	X	X	X	X	X	X
ME	Measurement	X	X	X	X	X	X	X
MY	Money	X	X	X	X	X	X	X
TE	Time	X	X	X	X	X	X	X
ES	Estimation	X	X	X	X	X	X	X
WP	Word Problems	X	X	X	X	X	X	X

Purpose

The purpose of the Met Instructional Coding System is to:

- Assist teachers manage the curriculum (Program of Studies).
- Decrease teacher time required to locate instructional and diagnostic materials appropriate for specific skills.
- To facilitate using the FCPS curriculum document(s), Program of Studies, effectively.

How to Use

The teacher may use the ICS in the following manner:

1. assess the students' skill needs
2. locate, in the POS, the skill(s) to be taught or re-taught
3. use the assigned alpha-numeric code for the specific skill(s) to identify which text(s) and page number(s) teach that skill. This information is found in the MET Correlation Chart for Mathematics Program of Studies
4. Use the code to locate the particular POS test(s) and test item(s) that assess the mastery level of the skill taught. This information is found in Record Keeping Section of the Management Support Kit, A Match of Math Test Items and Skills.

The Instructional Coding System, accompanied by the Math Correlation Chart and the Match of POS Test Items and skills, is an initial step toward designing an Instructional Management System. Classroom teachers may wish to add to the system.

The ICS code can be assigned to supplementary instructional materials to facilitate identification of other materials that teach specific skills. Teacher made tests and other assessment tools, also can use the ICS code to identify other diagnostic aids to assess students' skill needs and mastery levels.

Forms for teachers to begin this next step toward designing an Instructional Management System are included in the Management Support Kit. The Instructional Coding System: Supplementary materials for Mathematics Program of Studies Form is located in the POS Management Tools Section, Math Correlations Charts. The Instructional Coding System: Diagnostic Resources for Mathematics Program of Studies Form is located in the record keeping section, A match of Math Test Items and POS Skills.

GOALS OF KINDERGARTEN MATHEMATICS

The goals of kindergarten mathematics include building understandings in the meaning of and the combining of numbers; observing and talking about simple mathematical aspects of the environment. In:

- numeration, where the numbers 0 through 10 are important symbols with special meanings
- operations, where numbers of objects are combined and separated to develop understanding of the relation of the whole and its parts
- graphs, where comparisons are made by numbers and mathematical vocabulary is developed
- geometry, where certain shapes in the environment are identified
- measurement, where comparisons of the "size" of things are made
- money and in time, where numbers are used to tell "how much"

OBJECTIVES TO MEET THE GOALS

Exploration

MK EX 01.A Explores with capacities, weights, mirrors, colors, designs, objects.

Patterns

1. Kinds

MK PA 01.A Analyzes, duplicates, and continues patterns using devices such as rhythmic sequences, lines and dots, objects, geoboards, geometric shapes, and pictures.

2. Position

MK PA 02.A a. Uses words to denote position such as up, down, over, under, below, on, inside, outside, in front of, behind, beside, top, middle, bottom.

MK PA 02.B b. Uses correctly the words: left and right.

Sorting and Classifying

MK SC 01.A 1. Sorts and classifies according to each of the following: size, shape, color, detail, and texture.

MK SC 01.B 2. Discuss the common properties of a group of objects that have been sorted or classified.

Numeration

1. Whole Numbers

MK NU 01.A a. Counts from 1 through 10.

MK NU 01.B b. Reads the numbers 0 through 10.

MK NU 01.C c. Traces the numbers 0 through 10.

MK NU 01.D d. Matches the numbers 1 through 10 to the correct number of objects; matches the number of objects to the correct number (one-to-one correspondence).

MK NU 01.E e. Uses the word "zero" to mean "not any" or "there are none."

MK NU 01.F f. Counts backwards from 10 through 1.

MK NU 01.G g. Counts on through 10 from a given number (2 through 9).

MK NU 01.H h. Given two groups of objects, determines which has more, which has less, or if they have the same.

MK NU 01.I i. Given a number (0 through 9) names the number that is one more than; given a number (1 through 10) names the number that is one less than.

2. Ordinal Numbers

MK NU 02.A Recognize first and last, and makes correct assignment of ordinal numbers first through sixth.

3. Fractions

MK NU 03.A a. Recognizes two equal parts, with each part identified as one half.

MK NU 03.B b. Recognizes three and four equal parts.

Foundation for Operations

1. Addition, Subtraction, Multiplication, and Division

MK OP 01.A — Explores and describes the possible arrangements of a given number of objects.

2. Addition

MK OP 02.A — Intuitively adds, recognizes the whole as the sum of its parts (sums through 10, with objects).

3. Subtraction

MK OP 03.A — Intuitively subtracts, separating the whole into parts (minuends through 10, with objects).

Statistics and Graphs

1. Real, Picture, and Symbolic Graphs

MK ST 01.A — Compares two, three, and four groups by constructing first, real graphs; second, picture graphs; and third, symbolic graphs.

2. Bar Graphs

MK ST 02.A — Constructs simple bar graphs using objects and cutouts.

Geometry

MK GE 01.A — Identifies the following: circles, squares, rectangles, and triangles.

Measurement

1. Terms

MK ME 01.A — Uses terms such as longer and shorter; bigger and smaller; heavier and lighter; same; too little, too much, just right; hotter and colder.

2. Lengths

MK ME 02.A — Compares lengths of two or more objects.

3. Weights

MK ME 03.A — Compares weights of two or more objects.

4. Capacities

MK ME 04.A — Compares capacities of two or more containers.

5. Instruments

MK ME 05.A Recognizes that a thermometer measures temperature, a balance scale measures weight, and a ruler measures length.

Money

MK MY 01.A Selects the requested coin when given a penny, nickel, dime, and quarter.

Time

1. Events

MK TE 01.A a. Orders chronological events.

MK TE 01.B b. Explores duration of events by measuring the length of an event with a simple device such as a timer.

2. Clocks and Calendars

MK TE 02.A Recognizes clocks and calendars.

MK WP 01.A

Word problems in kindergarten mathematics are necessary for children to relate the language of mathematics to real-life experiences. Occasionally, kindergarten mathematics should be focused on word problems to extend children's understanding of the application of mathematical concepts. As much as possible children should be encouraged to act out the situation described in a problem.

MATHEMATICS, LEVEL 1

GOALS OF LEVEL 1 MATHEMATICS

The goals of level 1 mathematics include developing beginning skills in numbers and operations on numbers; understanding concepts that undergird those skills; learning simple patterns inherent in mathematics. In:

- numeration, where the number 0 through 100 are important symbols, with special meanings
- operations, where numbers are combined through addition and subtraction (sums and minuends through 99)
- statistics and graphs, where comparisons are made by number representations
- geometry, where circles, squares, rectangles, and triangles are analyzed for their characteristics
- measurement, where nonstandard units are used and standard units are introduced
- money, where values of collections of coins are determined (through 99)
- time, where hour and half-hour times are read; where calendars become important in telling "which day it is"

OBJECTIVES TO MEET THE GOALS

Patterns

1. Shapes

M1 PA 01.A — Continues size, shape, and color patterns in sequence of geometric shapes.

2. Numbers

M1 PA 02.A — a. Finds doubles of numbers (0 through 10).

M1 PA 02.B — b. Skip counts by 2's, 5's, and 10's (0 through 100).

M1 PA 02.C — c. Finds a given number in a patterned sequence of numbers (0 through 100).

M1 PA 02.D — d. Continues a given number pattern by finding or following the rule.

Numeration

1. Whole Numbers

M1 NU 01.A — a. Writes the numbers 0 through 10.

M1 NU 01.B — b. Reads the number words, zero through ten.

M1 NU 01.C — c. Counts forwards from 1 through 100.

M1 NU 01.D — d. Determines the number of objects in a group, first by sorting by tens and ones, then by counting the tens and the ones; identifies in 2-digit numbers the number of tens and ones; given the number of tens and ones identifies the number.

M1 NU 01.E — e. Reads and writes 2-digit numbers.

M1 NU 01.F — f. Counts forwards from a given number (through 100).

M1 NU 01.G — g. Counts backwards from a given number (from 100).

M1 NU 01.H — h. Identifies the number or numbers between two different numbers (through 100).

M1 NU 01.I — i. Identifies numbers that are greater than a given number and less than a given number (through 100).

2. Ordinal Numbers

M1 NU 02.A — Makes correct assignment of ordinal position first through tenth.

3. Fractions

M1 NU 03.A — Uses $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ to identify parts of a whole and parts of group.

Operations

1. Addition of Whole Numbers

M1 OP 01.A — a. Represents addition facts for sums through 18; writes facts in both horizontal and vertical forms.

M1 OP 01.B — b. Explores addition of two 2-digit numbers (sums to 99).

M1 OP 01.C — c. Adds three 1-digit numbers (sums to 18).

M1 OP 01.D — d. Recognizes the commutative property of addition.

2. Subtraction of Whole Numbers

M1 OP 02.A a. Represents subtraction facts with minuends through 18; writes facts in both horizontal and vertical forms.

M1 OP 02.B b. Explores subtraction of two 2-digit numbers (minuends to 99).

3. Addition and Subtraction of Whole Numbers

M1 OP 03.A a. Relates addition and subtraction facts through solving simple sentences involving families of numbers (missing addends, missing subtrahends, or missing minuends).

M1 OP 03.B b. Inserts the correct operation sign (+ or -) in a simple number sentence where the sign is missing.

Statistics and Graphs

1. Tallies

M1 ST 01.A Makes tallies to keep an accurate count of events.

2. Graphs

M1 ST 02.A a. Matches numbers to a graph (bar graphs).

M1 ST 02.B b. Constructs simple bar graphs.

Geometry

1. Polygons

M1 GE 01.A a. Identifies characteristics of circles, squares, rectangles, and triangles; discusses similarities and differences.

M1 GE 01.B b. Makes squares, rectangles, triangles, and circles.

2. Solids

M1 GE 02.A Recognizes rectangular solids (prisms), cubes, cylinders, cones, and spheres.

Measurement

1. Nonstandard

M1 ME 01.A a. Represents lengths and heights using nonstandard measures.

M1 ME 01.B b. Compares lengths and heights using nonstandard measures (longer, shorter).

M1 ME 01.C c. Compares weights using a balance scale (heavier, lighter).

M1 ME 01.D d. Compares sizes of objects (large, small).

M1 ME 01.E e. Continues to compare capacities of two or more containers (more, less).

2. Metric

M1 ME 02.A Measures lengths of objects in centimeters.

3. Traditional

M1 ME 03.A Measures lengths of objects in inches.

Money

1. Values

M1 MY 01.A a. Matches pennies, nickels, dimes, and quarters with their numerical values.

M1 MY 01.B b. Finds the value of a collection of pennies, nickels, dimes, and quarters using no more than three different coins (through 99¢).

2. Prices

M1 MY 02.A Matches prices of objects to a collection of pennies, nickels, and dimes (through 99¢).

Time

1. Clocks

M1 TE 01.A Reads and writes hour times and half-hour times.

2. Calendars

M1 TE 02.A a. Names consecutively the days of the week.

M1 TE 02.B b. Reads dates on a calendar.

Estimation

1. Time

M1 ES 01.A Estimates given time intervals; then measures using a simple timing device.

2. Operations

M1 ES 02.A Estimates sums and differences (sums through 99, minuends through 99).

3. Length

M1 ES 03.A a. Estimates given lengths in nonstandard units; then measures.

M1 ES 03.B b. Estimates how many times longer (2 through 6) lengths are as compared with given standards; then measures.

4. Fractional Parts

M1 ES 04.A Estimates fractional parts ($\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$) of given lengths or heights.

M1 WP 01.A

Word problems are an important part of level 1 mathematics as children relate mathematics to real-life experiences. Oral problems supported by objects and pictures, provide initial beginnings in word problems. Later, as children read simple one-step word problems, they begin to understand the application of mathematical concepts.

GOALS OF LEVEL 2 MATHEMATICS

The goals of level 2 mathematics include understanding and mastering beginning skills; building foundations for new skills; perceiving arithmetic and geometric patterns; continuing to develop mathematical language. In:

- numeration, where the numbers through 1,000 begin to show the unlimited nature of whole numbers; where fractions are used to show parts of a whole
- operations, where 2-digit numbers are combined through addition and subtraction; where one-digit numbers are combined through multiplication
- statistics and graphs, where information is gathered, organized, and reported using tallies, tables, and graphs
- geometry, where figures are analyzed for symmetry and congruency
- measurement, where metric and traditional units allow for more precise measurement
- money, where meaningful applications of collections of coins and bills are made
- time, where clocks and calendars are used

OBJECTIVES TO MEET THE GOALS

Patterns

1. Shapes

M2 PA 01.A Continues patterned sequences of geometric shapes.

2. Numbers

M2 PA 02.A a. Identifies even and odd numbers.

M2 PA 02.B b. Skip counts by 2's, 3's, 4's, 5's, and 10's (in sequences between 0 and 1,000).

M2 PA 02.C c. Determines the rule for continuing a pattern in a sequence of numbers for numbers learned at this level.

Numeration

1. Whole Numbers

M2 NU 01.A — a. Reads and writes 3-digit numbers.

M2 NU 01.B — b. Counts forwards from a given number (through 1,000); counts backwards from a given number (from 1,000).

M2 NU 01.C — c. Identifies in 3-digit numbers the number of hundreds, tens, and ones; given the number of hundreds, tens, and ones identifies the number.

M2 NU 01.D — d. Identifies the number or numbers between two different numbers (through 1,000).

M2 NU 01.E — e. Identifies numbers that are greater than or less than a given number (through 1,000).

M2 NU 01.F — f. Uses correctly the symbols < , =, > between two numbers (through 1,000).

2. Ordinal Numbers

M2 NU 02.A — Makes correct assignment of ordinal position first through twelfth.

3. Fractions

M2 NU 03.A — Uses halves, thirds, fourths, fifths and other common fractions to identify parts of a whole and parts of a group.

Operations

1. Addition of Whole Numbers

M2 OP 01.A — a. Knows addition facts for sums through 18.

M2 OP 01.B — b. Adds two numbers having as many as two digits each (sums through 99).

M2 OP 01.C — c. Adds three numbers having as many as two digits each (sums through 99).

M2 OP 01.D — d. Recognizes the following properties of addition

(1) adding the number 0 (identity property; 5 + 0 = 5; 0 + 5 = 5)

(2) switching addends (commutative property; 2 + 3 = 3 + 2)

2. Subtraction of Whole Numbers

M2 OP 02.A a. Knows subtraction facts with minuends through 18.

M2 OP 02.B b. Subtracts two numbers having as many as two digits each.

3. Addition and Subtraction of Whole Numbers

M2 OP 03.A a. Recognizes that addition and subtraction are inverse operations; checks subtraction by addition.

M2 OP 03.B b. Relates addition and subtraction through solving simple sentences involving families of numbers (missing addends, missing subtrahends and minuends; inverse operations) for numbers learned at this level.

M2 OP 03.C c. Inserts the correct operation sign (+ or -) in a number sentence where the sign is missing for numbers learned at this level.

M2 OP 03.D d. Adds and subtracts several numbers (chain calculations).

4. Multiplication of Whole Numbers

M2 OP 04.A a. Represents multiplication facts for products through 81; writes facts in both horizontal and vertical forms.

M2 OP 04.B b. Multiplies 1-digit numbers by 10, and 10 by 10.

M2 OP 04.C c. Recognizes the commutative property of multiplication ($2 \times 3 = 3 \times 2$).

5. Division of Whole Numbers

M2 OP 05.A Explores division facts.

Statistics and Graphs

1. Tallies

M2 ST 01.A Makes and summarizes tallies to keep track of events.

2. Graphs

M2 ST 02.A Interprets and constructs simple bar and picture graphs.

3. Tables

M2 ST 03.A Reads and interprets simple tables.

Geometry

1. Polygons

M2 GE 01.A — Identifies squares, rectangles, and triangles according to number and length of sides and number of corners.

2. Solids

M2 GE 02.A — Identifies examples of solids within the environment.

3. Symmetry

M2 GE 03.A — Determines lines of symmetry in plane geometric figures.

4. Congruency

M2 GE 04.A — Identifies two or more congruent plane geometric figures.

Measurement

1. Metric

M2 ME 01.A — a. Measures lengths of objects in centimeters and meters.

M2 ME 01.B — b. Discusses the relationship between centimeters and meters.

M2 ME 01.C — c. Measures weights of objects in grams and kilograms.

M2 ME 01.D — d. Discusses the relationship between grams and kilograms.

M2 ME 01.E — e. Measures volumes of containers in liters.

2. Traditional

M2 ME 02.A — a. Measures lengths of objects in inches, feet, and yards.

M2 ME 02.B — b. Discusses the relationships among inches, feet, and yards.

M2 ME 02.C — c. Measures weights of objects in ounces and pounds.

M2 ME 02.D — d. Discusses the relationship between ounces and pounds.

M2 ME 02.E — e. Measures volumes of containers in cups, pints, and quarts.

M2 ME 02.F — f. Discusses the relationships among cups, pints, and quarts.

3. Dozen

M2 ME 03.A — Recognizes that a dozen is 12 objects; that 1/2 a dozen is 6 objects.

4. Area

M2 ME 04.A Finds areas by counting squares (whole numbers only).

Money

1. Collection of Coins and Bills

M2 MY 01.A Finds the value of a collection of coins (including half-dollars) and $1 bills.

M2 MY 02.A 2. Writes money value both with cents and decimal notation.

3. Addition

M2 MY 03.A Adds two money amounts (cents).

4. Subtraction

M2 MY 04.A Subtracts two money amounts (cents).

Time

1. Clocks

M2 TE 01.A a. Uses the words "quarter" and "half" to express multiples of 15 minutes on a clock face.

M2 TE 01.B b. Reads and writes time to the nearest five minutes.

2. Calendars

M2 TE 02.A a. Names consecutively the months in the year and states the number of days in each month.

M2 TE 02.B b. Examines a monthly calendar for relationships among days, weeks, and months.

Estimation

1. Number

M2 ES 01.A Estimates the number of objects in a given set of objects for numbers learned at this level.

2. Operations

M2 ES 02.A Estimates sums and differences for numbers learned at this level.

3. Metric Measurement

M2 ES 03.A a. Estimates lengths of objects in centimeters; then measures.

M2 ES 03.B b. Estimates lengths of objects in meters; then measures.

M2 ES 03.C c. Estimates weights of objects in grams; then measures.

M2 ES 03.D d. Estimates weights of objects in kilograms; then measures.

M2 ES 03.E e. Estimates volumes of containers in liters; then measures.

4. Traditional Measurement

M2 ES 04.A a. Estimates lengths of objects in inches; then measures.

M2 ES 04.B b. Estimates lengths of objects in feet; then measures.

M2 ES 04.C c. Estimates weights of objects in ounces and pounds; then measures.

M2 ES 04.D d. Estimates volumes of containers in quarts; then measures.

M2 WP 01.A

Word problems are an integral part of level 2 mathematics. Children should not only solve but create their own word problems. Simple one- and two-step word problems should stress problem solving techniques as well as involve the application of mathematical concepts.

MATHEMATICS, LEVEL 3

GOALS OF LEVEL 3 MATHEMATICS

The goals of level 3 mathematics include exploring patterns of numbers within the base ten system; understanding that skills developed with small whole numbers can be applied to larger whole numbers; classifying geometric figures according to their properties; gathering and organizing data for simple interpretation; continuing to develop mathematical language, particularly for fractions and decimals. In:

- numeration, where numbers through the hundred thousands are seen as the sum of their place-value parts; where fractions define parts of a group or a whole; where decimals are introduced following patterns inherent in the number system

- operations, where numbers having as many as four digits are combined through addition and subtraction and the inverse relationship is observed; where multiplication and division facts are learned

- statistics and graphs, where information from charts, tables and graphs is interpreted; where ordered pairs are introduced

- geometry, where lines, points, and angles are used to define figures; where symmetry and congruency are used to compare figures

- measurement, where metric and traditional units allow for precise measurement; where perimeter and area describe the size of plane figures

- money, where applications of computing with money amounts are made

- time, where time to the nearest minute is read and time intervals are determined

OBJECTIVES TO MEET THE GOALS

<u>Number Patterns</u>

M3 <u>PA</u> 01.A Finds or follows the rule of a pattern for numbers learned at this level.

Numeration

1. Whole Numbers

M3 NU 01.A — a. Identifies in numbers having as many as six digits the number of hundred thousands, ten thousands, thousands, hundreds, tens, and ones; assigns place value; writes these numbers.

M3 NU 01.B — b. Counts forwards from a given number (through 1,000,000); counts backwards from a given number (from 1,000,000).

M3 NU 01.C — c. Identifies numbers that are greater than or less than a given number (through 1,000,000).

M3 NU 01.D — d. Uses correctly the symbols $<$, $=$, $>$ between two numbers (through 1,000,000).

M3 NU 01.E — e. Rounds to the nearest ten.

2. Fractions

M3 NU 02.A — a. In common fractions, recognizes that the numerator indicates the part and the denominator the whole.

M3 NU 02.B — b. Recognizes that the same fractional part of two different wholes or groups are not necessarily equal.

M3 NU 02.C — c. Compares two different fractional parts of the same whole (like denominators and unlike numerators).

M3 NU 02.D — d. Represents equivalent fractions with denominators through tenths.

3. Decimals

M3 NU 03.A — a. Writes decimals for tenths and relates to fractions.

M3 NU 03.B — b. Writes decimals for hundredths and relates to fractions.

M3 NU 03.C — c. Uses the symbols $<$, $=$, $>$ between two decimals (through tenths).

4. Roman Numerals

M3 NU 04.A — Reads and writes Roman numerals (through thousands).

Operations

1. Addition of Whole Numbers

M3 OP 01.A — a. Adds two numbers where the numbers may have as many as four digits.

M3 OP 01.B b. Adds three and four addends with each addend having no more than four digits.

M3 OP 01.C c. Applies the following properties of addition

(1) adding the number 0 (identity property; $3 + 0 = 3$; $0 + 3 = 3$)

(2) switching addends (commutative property; $2 + 3 = 3 + 2$)

(3) grouping addends [associative property; $(2 + 3) + 4 = 2 + (3 + 4)$]

2. Subtraction of Whole Numbers

M3 OP 02.A a. Subtracts two numbers where the minuend has as many as four digits.

M3 OP 02.B b. Recognizes that subtraction is neither commutative nor associative.

3. Addition and Subtraction of Whole Numbers

M3 OP 03.A Relates addition and subtraction through solving simple sentences involving families of numbers (missing addends, missing minuends and subtrahends, inverse operations) for numbers learned at this level.

4. Multiplication of Whole Numbers

M3 OP 04.A a. Relates repeated addition to multiplication.

M3 OP 04.B b. Knows multiplication facts for products through 81; writes facts in both horizontal and vertical forms.

M3 OP 04.C c. Multiplies three 1-digit factors.

M3 OP 04.D d. Recognizes and applies the following properties of multiplication

(1) multiplying by the number 1 (identity property; $3 \times 1 = 3$)

(2) multiplying by the number 0 ($3 \times 0 = 0$; $0 \times 3 = 0$)

(3) switching factors (commutative property; $2 \times 3 = 3 \times 2$)

M3 OP 04.E e. Multiplies numbers having as many as three digits by 10.

M3 OP 04.F f. Finds squares of numbers 0 through 10.

M3 OP 04.G g. Multiplies 2- and 3-digit numbers by 1-digit numbers.

5. Division of Whole Numbers

M3 OP 05.A a. Represents division facts; writes facts with both ÷ and ⌐.

M3 OP 05.B b. Recognizes that a number divided by 1 is the number, and that 0 divided by a number other than 0 is 0.

M3 OP 05.C c. Divides 1- and 2-digit numbers by 1-digit numbers.

6. Multiplication and Division of Whole Numbers

M3 OP 06.A Relates multiplication and division through solving simple sentences involving familes of numbers (missing factors, missing divisors and dividends) for numbers learned at this level.

7. Addition, Subtraction, Multiplication, and Division of Whole Numbers

M3 OP 07.A Makes chain calculations.

8. Addition of Decimals

M3 OP 08.A Adds two decimals (through tenths).

9. Subtraction of Decimals

M3 OP 09.A Subtracts two decimals (through tenths).

Statistics and Graphs

1. Graphs and Tables

M3 ST 01.A a. Reads and interprets data from bar graphs, line graphs, and tables.

M3 ST 01.B b. Compiles data into graphs and tables.

2. Ordered Pairs

M3 ST 02.A Graphs ordered pairs of whole numbers on a grid.

Geometry

1. Lines, Angles, and Polygons

M3 GE 01.A a. Identifies points, lines, and angles.

M3 GE 01.B b. Identifies parallel sides in a given quadrilateral.

M3 GE 01.C c. Names parallelograms and trapezoids.

M3 GE 01.D d. Identifies right angles.

2. Circles

M3 GE 02.A a. Recognizes that the points of a circle are all the same distance from the center.

M3 GE 02.B b. Relates diameters and radii of a circle.

3. Symmetry

M3 GE 03.A Draws lines of symmetry in plane geometric figures.

4. Congruency

M3 GE 04.A Describes congruency and matches congruent plane geometric figures.

5. Similarity

M3 GE 05.A Describes similarity and matches similar plane geometric figures.

6. Solids

M3 GE 06.A Identifies faces and edges in solid geometric figures.

Measurement

1. Metric

M3 ME 01.A a. Discusses the relationship between meters and kilometers.

M3 ME 01.B b. Measures lengths in decimeters; discusses the relationships among centimeters, decimeters, and meters.

M3 ME 01.C c. Measures volumes in cubic centimeters, milliliters, and liters; discusses the relationship between milliliters and liters.

2. Traditional

M3 ME 02.A a. Discusses the relationships among feet, yards, and miles.

M3 ME 02.B b. Discusses the relationship between pounds and tons.

M3 ME 02.C c. Measures volume in gallons; discusses the relationships among cups, pints, quarts, and gallons.

3. Temperature

M3 ME 03.A a. Writes temperatures in degrees Celsius (whole numbers).

M3 ME 03.B b. Writes temperatures in degrees Fahrenheit (whole numbers).

4. Perimeter

M3 ME 04.A Finds perimeters of polygons by adding the lengths of the sides.

5. Area

M3 ME 05.A Finds areas of rectangles by multiplying the length and width.

6. Volume

M3 ME 06.A Finds volumes of solids constructed from cubes by counting the number of cubic units.

7. Scale Drawings

M3 ME 07.A Makes simple scale drawings on a grid.

8. Approximate Nature of Measurement

M3 ME 08.A Recognizes that all measurement is approximate and appreciates the fact that the smaller the unit of measurement the closer the approximate measure.

Money

1. Collection of Coins and Bills

M3 MY 01.A Finds the value of a collection of coins and bills ($1 and $5).

2. Addition

M3 MY 02.A Adds two money amounts (sums through $99.99).

3. Subtraction

M3 MY 03.A Subtracts two money amounts (minuends through $99.99).

4. Multiplication

M3 MY 04.A Multiplies money amounts (through $99.99) by 1-digit numbers.

5. Rounding

M3 MY 05.A a. Rounds to the nearest 10 cents.

M3 MY 05.B b. Rounds to the nearest dollar.

6. Change

M3 MY 06.A Determines how much change will be received from $5.00 or less when paying for an item with an amount of money less than $5.00.

Time

1. Clocks

M3 TE 01.A — a. Reads and writes time to the nearest minute, including before and after the hour.

M3 TE 01.B — b. Tells how many hours and how many minutes between two given times.

2. Calendars

M3 TE 02.A — On a yearly calendar finds intervals of from one to four weeks from a given day.

Estimation

1. Operations

M3 ES 01.A — a. Estimates sums and differences for numbers learned at this level.

M3 ES 01.B — b. Estimates products for numbers learned at this level.

2. Metric Measurement

M3 ES 02.A — a. Estimates lengths of objects in meters; then measures.

M3 ES 02.B — b. Estimates volumes of containers in milliliters; then measures.

3. Traditional Measurement

M3 ES 03.A — a. Estimates lengths of objects in yards; then measures.

M3 ES 03.B — b. Estimates volumes of containers in cups, pints, quarts, and gallons; then measures.

M3 WP 01.A

Word Problems

In level 3 mathematics children see the application of mathematics to real-world situations through word problems. They read and analyze problems to determine methods for solution. They understand that arithmetic operations are the means for solving problems and determine which operations must be applied. Often the word problems require two or three steps to reach a solution. Children learn that problems may be approached and solved in many different ways.

MATHEMATICS, LEVEL 4

GOALS OF LEVEL 4 MATHEMATICS

The goals of level 4 mathematics include expanding previous understandings of the base 10 number system with whole numbers, fractions, and decimals; refining skills for collecting and recording data; understanding how points and lines relate to geometric figures; measuring more accurately and choosing appropriate units of measurement; improving skills in arriving at reasonable answers to problems. In:

- numeration, where whole numbers through hundreds of millions and hundredths follow established patterns; where decimals exhibit properties similar to whole numbers and fractions

- operations, where multidigit numbers are added and subtracted, and multiplication is applied to three-digit numbers; where division with two-digit divisors is introduced; where fractions and decimals are added and subtracted; where foundations are laid for multiplying fractions

- geometry, where figures are analyzed through parallel, perpendicular, and intersecting lines and line segments; where congruence and similarity take on clearer meanings

- statistics and graphs, where data from tables and graphs are analyzed

- measurement, where skills with metric and traditional units are refined; where perimeter, and area concepts are applied; where simple maps are interpreted according to scaled distances

- money, where an introduction to multiplication and division of decimals is made through multiplying and dividing money amounts by 1-digit numbers

- time, where concepts of time in terms as exact as seconds are introduced and a year is broken down into smaller units

OBJECTIVES TO MEET THE GOALS

Number Patterns

M4 PA 01.A 1. Finds or follows the rule for a pattern for numbers learned at this level.

M4 PA 02.A 2. Finds numbers that are in a pattern when given the rule for the pattern for numbers learned at this level.

Numeration

1. Whole Numbers

M4 NU 01.A — a. Assigns place value through hundreds of millions; writes these numbers.

M4 NU 01.B — b. Counts forwards from a given number (through 1,000,000,000); counts backwards from a given number (from 1,000,000,000).

M4 NU 01.C — c. Identifies numbers that are between two different numbers; and numbers that are greater than or less than a given number (through 1,000,000,000).

M4 NU 01.D — d. Uses correctly the symbols <, =, > between two numbers (through 1,000,000,000).

M4 NU 01.E — e. Rounds given numbers to the nearest hundred or to the nearest thousand.

2. Fractions and Mixed Numbers

M4 NU 02.A — a. Finds equivalent proper fractions including those equivalent to the number 1.

M4 NU 02.B — b. Uses correctly the symbols <, =, > between two proper fractions.

M4 NU 02.C — c. Relates mixed numbers to improper fractions; changes from one form to the other.

3. Decimals

M4 NU 03.A — a. Assigns place value through hundredths; writes these numbers.

M4 NU 03.B — b. Uses correctly the symbols <, =, > between two decimals (through hundredths).

Operations

1. Addition of Whole Numbers

M4 OP 01.A — Adds two multidigit numbers; makes column additions.

2. Subtraction of Whole Numbers

M4 OP 02.A — Subtracts two multidigit numbers.

3. Addition and Subtraction of Whole Numbers

M4 OP 03.A Relates addition and subtraction through solving number sentences involving number families, (missing addends, missing minuends and subtrahends, inverse operations) for numbers learned at this level.

4. Multiplication of Whole Numbers

M4 OP 04.A a. Recognizes and applies the associative property of multiplication $[(2 \times 3) \times 6 = 2 \times (3 \times 6)]$.

M4 OP 04.B b. Multiplies given numbers by multiples of 10 (through thousands).

M4 OP 04.C c. Multiplies numbers having as many as three digits by numbers having as many as two digits.

5. Division of Whole Numbers

M4 OP 05.A a. Divides numbers having as many as four digits by 1-digit numbers.

M4 OP 05.B b. Divides numbers having as many as three digits by 2-digit multiples of 10.

6. Multiplication and Division of Whole Numbers

M4 OP 06.A a. Recognizes that multiplication and division are inverse operations; checks division by multiplication.

M4 OP 06.B b. Relates multiplication and division through solving sentences involving number families, (missing factors, missing divisors and dividends, inverse operations) for numbers learned at this level.

7. Addition, Subtraction, Multiplication, and Division of Whole Numbers

M4 OP 07.A Completes operations where the order of the operation is indicated by parenthses.

8. Averages

M4 OP 08.A Computes averages (whole number answers).

9. Addition of Fractions and Mixed Numbers

M4 OP 09.A a. Adds two proper fractions written in both horizontal and vertical forms.

M4 OP 09.B b. Explores addition of mixed numbers.

10. Subtraction of Fractions and Mixed Numbers

M4 OP 10.A a. Subtracts two proper fractions written in both horizontal and vertical forms.

M4 OP 10.B b. Explores subtraction of mixed numbers.

11. Multiplication of Fractions

M4 OP 11.A Finds fractional parts of whole numbers where the whole number is divisible by the denominator of the fraction.

12. Addition of Decimals

M4 OP 12.A Adds two decimals (through hundredths).

13. Subtraction of Decimals

M4 OP 13.A Subtracts two decimals (through hundredths).

Statistics and Graphs

1. Graphs and Tables

M4 ST 01.A Analyzes data from bar graphs, line graphs, and tables.

2. Ordered Pairs

M4 ST 02.A Names ordered pairs for given points (whole numbers).

Geometry

1. Lines, Angles, and Polygons

M4 GE 01.A a. Identifies quadrilaterals, pentagons, hexagons, and octogons.

M4 GE 01.B b. Recognizes intersecting, perpendicular, and parallel lines.

M4 GE 01.C c. Distinguishes between lines and line segments.

2. Congruency

M4 GE 02.A Recognizes congruent sides in plane geometric figures.

Measurement

1. Metric

M4 ME 01.A a. Writes equivalent measures involving kilometers, meters, centimeters, decimeters, and millimeters.

M4 ME 01.B b. Writes equivalent measures for grams and kilograms.

M4 ME 01.C c. Writes equivalent measures involving cubic centimeters, milliliters, and liters.

M4 ME 01.D d. Chooses an appropriate unit of measure when measuring a given quantity.

2. Traditional

M4 ME 02.A a. Writes equivalent measures involving inches, feet, yards, and miles.

M4 ME 02.B b. Measures length to the nearest fraction of an inch (halves, fourths, and eighths).

M4 ME 02.C c. Writes equivalent measures involving ounces, pounds, and tons.

M4 ME 02.D d. Writes equivalent measures involving cups, pints, quarts, and gallons.

M4 ME 02.E e. Chooses an appropriate unit of measure when measuring a given quantity.

3. Perimeter

M4 ME 03.A Finds perimeters of regular and irregular polygons.

4. Area

M4 ME 04.A a. Finds areas of polygons by counting squares including half squares.

M4 ME 04.B b. Finds areas of squares by multiplying the length of a side by itself.

5. Maps

M4 ME 05.A Reads simple maps or blueprints translating scales on maps to actual distances.

Money

1. Collections of Coins and Bills

M4 MY 01.A Recognizes bills ($1, $5, $10, $20); determines values of collection of coins and bills.

2. Money Amounts

M4 MY 02.A a. Compares fractions of a dollar with the number of cents they represent ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$).

M4 MY 02.B b. Uses correctly the symbols <, =, > between two money amounts.

3. Addition

M4 MY 03.A Adds two or more money amounts (sums through $999.99).

4. Subtraction

M4 MY 04.A Subtracts two money amounts (minuends through $999.99).

5. Addition and Subtraction

M4 MY 05.A Determines how much change will be given when paying for several items with a given collection of coins and bills.

6. Multiplication

M4 MY 06.A Multiplies money amounts (through $999.99) by 1-digit numbers.

7. Division

M4 MY 07.A Divides money amounts (through $999.99) by 1-digit numbers.

Time

1. Hours, Minutes, and Seconds

M4 TE 01.A a. Knows the number of minutes in an hour and the number of seconds in a minute.

M4 TE 01.B b. Differentiates times by using A.M. and P.M.

M4 TE 01.C c. Reads digital clocks.

M4 TE 01.D d. Finds time before given times and after given times.

2. Years, Months, Weeks, and Days

M4 TE 02.A a. Writes equivalent measures for hours, days, weeks, months, and years.

M4 TE 02.B b. Writes dates with slashes; e.g., September 23, 1982 is 9/23/82.

Estimation

M4 ES 01.A 1. Estimates indicated sums for numbers learned at this level.

M4 ES 02.A 2. Estimates indicated differences for numbers learned at this level.

M4 ES 03.A 3. Estimates indicated products for numbers learned at this level.

M4 ES 04.A 4. Determines if an answer to a problem is reasonable.

M4 WP 01.A

Word Problems in level 4 mathematics are not only important in real-life applications but in problem solving. Students learn to approach a new problem situation and to stay with the problem even though the answer is not easily obtained. They decide what information is necessary to solve a problem and to choose the correct operation or operations to reach the solution.

MATHEMATICS, LEVEL 5

GOALS OF LEVEL 5 MATHEMATICS

The goals of level 5 mathematics include exploring patterns with mixed numbers and ratios; graphing sets of ordered pairs and observing the patterns; learning more about geometric figures and the means by which these figures are labeled; applying mathematical situations to both money and time. In:

- numeration, where fractions and decimals are ordered; where ratios are used to compare two numbers
- operations, where multidigit numbers are multiplied; where multidigit numbers are divided by 2-digit numbers; where decimals are multiplied; where mixed numbers are added, subtracted, and multiplied
- equations, where sums, differences, products, and quotients are found by solving for the unknown quantity represented by a letter
- statistics and graphs, where sets of ordered pairs depict a pattern; where intuitive understandings of probability are developed
- geometry, where labeling becomes an important means of identification
- measurement, where metric system prefixes are examined for their decimal relationships and conversions are made from one metric unit to another; where angles are measured; where formulas are introduced
- money, where applications are made
- time, where time zones within the United States are described

OBJECTIVES TO MEET THE GOALS

Number Patterns

M5 PA 01.A 1. Finds or follows the rule for a pattern for numbers learned at this level.

M5 PA 02.A 2. Makes addition and multiplication tables of even and odd integers.

Numeration

1. Fractions

M5 NU 01.A — a. Uses correctly the symbols <, =, > between two given fractions.

M5 NU 01.B — b. Finds the missing numerator or denominator in equivalent fractions.

M5 NU 01.C — c. Renames fractions in simplest form.

2. Decimals

M5 NU 02.A — a. Assigns place value through thousandths; writes these numbers.

M5 NU 02.B — b. Writes fractions with denominators 10, 100, and 1,000 as decimals.

M5 NU 02.C — c. Recognizes and writes equivalent decimals; e.g., 0.3 and 0.30.

M5 NU 02.D — d. Uses correctly the symbols <, =, > between two decimals (through thousandths).

3. Decimals and Fractions

M5 NU 03.A — Writes fractions as decimals (remainder, zero).

4. Ratios

M5 NU 04.A — a. Interprets ratios; writes ratios as fractions.

M5 NU 04.B — b. Makes equal ratios by finding a missing numerator or a missing denominator.

M5 NU 04.C — c. Relates ratios to rates.

Operations

1. Multiplication of Whole Numbers

M5 OP 01.A — a. Multiplies given numbers by multiples of 10 (through ten thousands).

M5 OP 01.B — b. Multiplies two multidigit numbers.

2. Division of Whole Numbers

M5 OP 02.A — a. Divides numbers having as many as five digits by 1-digit numbers.

M5 OP 02.B — b. Divides numbers having as many as four digits by 2-digit numbers.

3. Addition of Mixed Numbers

M5 OP 03.A — Adds a whole number and a mixed number; adds a proper fraction and a mixed number; adds two mixed numbers.

4. Subtraction of Mixed Numbers

M5 OP 04.A — Subtracts a whole number and a mixed number; subtracts a proper fraction and a mixed number; subtracts two mixed numbers.

5. Multiplication of Fractions and Mixed Numbers

M5 OP 05.A — a. Multiplies whole numbers by proper fractions; relates the word "of" with multiplication.

M5 OP 05.B — b. Multiplies two proper fractions.

M5 OP 05.C — c. Multiplies a whole number and a mixed number; multiplies a proper fraction and a mixed number; multiplies two mixed numbers.

6. Addition of Decimals

M5 OP 06.A — Adds two decimals (through thousandths).

7. Subtraction of Decimals

M5 OP 07.A — Subtracts two decimals (through thousandths).

8. Multiplication of Decimals

M5 OP 08.A — a. Multiplies decimals by 10, 100, and 1,000.

M5 OP 08.B — b. Multiplies whole numbers with as many as four digits by decimals (through thousandths).

M5 OP 08.C — c. Multiplies two decimals (through thousandths).

9. Division of Decimals

M5 OP 09.A — a. Divides decimals by 10, 100, and 1,000.

M5 OP 09.B — b. Divides decimals by whole numbers having one or two digits.

10. Ratios and Rates

M5 OP 10.A — Uses ratios to find rates such as unit costs and speed.

Equations

M5 EQ 01.A — 1. Solves equations such as: $41 + 372 = n$; $n = 41 + 372$.

M5 EQ 02.A 2. Solves equations such as: 763 - 27 = n; n = 763 - 27.

M5 EQ 03.A 3. Solves equations such as: 532 x 7 = n; n = 532 x 7.

M5 EQ 04.A 4. Solves equations such as: 136 ÷ 8 = n; n = 136 ÷ 8.

Statistics and Graphs

1. Graphs

M5 ST 01.A Constructs bar and line graphs from given sets of data.

2. Probability

M5 ST 02.A Interprets probabilities; writes probabilities as fractions.

Geometry

1. Lines, Angles, and Polygons

M5 GE 01.A a. Identifies right, acute, obtuse, and straight angles.

M5 GE 01.B b. Labels the endpoints of a line segment.

M5 GE 01.C c. Labels a line by naming two points on the line; labels intersecting lines including the point of intersection.

M5 GE 01.D d. Labels an angle including the rays and vertex.

M5 GE 01.E e. Relates quadrilaterals, parallelograms, rectangles, and squares.

2. Circles

M5 GE 02.A Labels the center point of a circle; labels diameters, radii, and chords.

3. Similarity

M5 GE 03.A Identifies similar triangles, noting the proportional sides.

4. Solids

M5 GE 04.A Identifies cubes; identifies rectangular, triangular, and hexagonal prisms; identifies triangular, rectangular, and square pyramids.

Measurement

1. Metric

M5 ME 01.A a. Uses correctly the metric prefixes: milli-, centi, deci-, kilo-; describes their decimal relationships.

M5 ME 01.B b. Converts among metric measures for length, weight, and volume.

2. Traditional

M5 ME 02.A a. Measures lengths to fractions of an inch.

M5 ME 02.B b. Converts among traditional measures for length, weight, and volume.

3. Area

M5 ME 03.A a. Uses the formula A = lw to find areas of rectangles.

M5 ME 03.B b. Uses the formula A = ½bh to find areas of right triangles.

4. Volume

M5 ME 04.A Finds volumes of rectangular prisms by multiplying length times width times height.

5. Temperature

M5 ME 05.A Measures temperatures in degrees Celsius and in degrees Fahrenheit, including degrees below zero.

6. Angles

M5 ME 06.A Measures angles in degrees (with protractors).

7. Maps

M5 ME 07.A Adds and subtracts distances on maps.

Money

1. Collections of Coins and Bills

M5 MY 01.A Determines values of collections of coins and bills (including $100 bills).

2. Multiplication

M5 MY 02.A Multiplies money amounts by 2-digit numbers.

3. Division

M5 MY 03.A Divides money amounts by 2-digit numbers.

4. Costs

M5 MY 04.A a. Determines the cost of several different purchases, including identical items.

M5 MY 04.B

b. Tells how much change will be given when paying for several different items (including identical items) with a given collection of coins and bills.

Time

M5 TE 01.A

Knows the time zones within the United States; describes changes in time from one zone to another.

Estimation

1. Operations

M5 ES 01.A

a. Estimates indicated sums for numbers learned at this level.

M5 ES 01.B

b. Estimates indicated differences for numbers learned at this level.

M5 ES 01.C

c. Estimates indicated products for numbers learned at this level.

M5 ES 01.D

d. Estimates indicated quotients for numbers learned at this level.

2. Money

M5 ES 02.A

a. Estimates if given amounts of money will buy one or more items.

M5 ES 02.B

b. Estimates costs to the nearest dollar.

M5 ES 02.C

c. Estimates the sum of two money amounts.

M5 ES 02.D

d. Estimates the difference of two money amounts.

M5 WP 01.A

Word Problems in level 5 mathematics particularly lend themselves to critical thinking and problem solving. Word problems become viable means to introduce new concepts and master the meaning of those concepts. Deciding which techniques to apply to a given problem, how many steps will be needed, and if the answer is reasonable are important steps to finding solutions. Students should be encouraged not only to solve given problems but to modify them and to create their own problems, which in turn, can be submitted for solutions.

GOALS OF LEVEL 6 MATHEMATICS

The goals of level 6 mathematics include exploring patterns with integers and percents; learning about prime and composite numbers and about expanded notation; building foundations for operations on integers; graphing straight lines; identifying special kinds of quadrilaterals and triangles; using formulas to find areas and volumes. In:

- numeration, where powers of ten are used in writing whole numbers; where divisibility, prime and composite numbers, prime factorizations, and multiples provide another way of investigating whole numbers; where integers are introduced; where fractions and percents are related

- operations, where integers are added and subtracted; where fractions are divided; where percents of numbers are found

- equations, where unknowns are found in simple statements of equality

- statistics and graphs, where straight-line graphs made from ordered pairs are constructed; where means, medians, and modes provide a means of interpreting sets of data; where probabilities give other meanings to fractions, decimals, and percents

- geometry, where rectangles, squares, and rhombuses are seen as parallelograms and three kinds of triangles are identified; where circles are constructed

- measurement, where formulas for areas and volumes are developed and used; where perimeters include circumferences of circles, where temperatures are compared and ranges of temperature are found

- money, where making change by counting upwards from the cost to the amount given is learned

OBJECTIVES TO MEET THE GOALS

Number Patterns

M6 PO 01.A Finds or follows the rule for a pattern for numbers learned at this level.

Numeration

1. Whole Numbers

M6 NU 01.A — a. Finds the least common multiple of two given numbers.

M6 NU 01.B — b. Uses divisibility rules for 2, 3, 5, 9, and 10.

M6 NU 01.C — c. Finds the factors of given numbers.

M6 NU 01.D — d. Finds the greatest common factor of two given numbers.

M6 NU 01.E — e. Identifies prime and composite numbers.

M6 NU 01.F — f. Finds the prime factorization of given numbers.

2. Exponents

M6 NU 02.A — a. Writes powers of 10 in exponential form (whole numbers).

M6 NU 02.B — b. Writes numbers using powers of 10 and exponents (expanded notation).

M6 NU 02.C — c. Writes numbers corresponding to given expanded notations.

M6 NU 02.D — d. Finds cubes of given numbers (less than 10).

3. Integers

M6 NU 03.A — a. Illustrates the integers; writes negative integers using the symbol (-) or $^{-}$; writes positive integers using the symbol (+) or $^{+}$.

M6 NU 03.B — b. Orders two given integers.

4. Decimals

M6 NU 04.A — a. Assigns place value through hundred thousandths; writes these numbers.

M6 NU 04.B — b. Uses correctly the symbols $<$, $=$, $>$ between two decimals (through hundred thousandths).

M6 NU 04.C — c. Rounds a given decimal to the nearest whole number, tenth, hundredth, or thousandth.

5. Fractions and Decimals

M6 NU 05.A — Writes common fractions as decimals, including repeating decimals.

6. Percents

M6 NU 06.A — a. Writes ratios in hundredths as percents.

M6 NU 06.B b. Writes given percents as fractions and given fractions as percents.

Operations

1. Division of Whole Numbers

M6 OP 01.A Divides multidigit numbers by 2- and 3-digit numbers.

2. Addition of Integers

M6 OP 02.A Adds two integers; recognizes that addition of an integer and the negative of that integer is the number 0.

3. Subtraction of Integers

M6 OP 03.A Subtracts two integers.

4. Division of Fractions and Mixed Numbers

M6 OP 04.A a. Writes the multiplicative inverse (reciprocal) of a fraction, a nonzero whole number, or a mixed number.

M6 OP 04.B b. Divides two proper fractions.

M6 OP 04.C c. Divides whole numbers and mixed numbers by fractions and by mixed numbers; divides mixed numbers by whole numbers.

5. Addition of Decimals

M6 OP 05.A Adds two decimals (through hundred thousandths).

6. Subtraction of Decimals

M6 OP 06.A Subtracts two decimals (through hundred thousandths).

7. Division of Decimals

M6 OP 07.A Divides decimals by decimals (through hundredths).

8. Percents of Numbers

M6 OP 08.A a. Finds percents of whole numbers.

M6 OP 08.B b. Determines sales taxes and discounts (whole number prices).

Equations

M6 EQ 01.A 1. Solves equations such as: $n + 12 = 25$.

M6 EQ 02.A 2. Solves equations such as: $n - 42 = 25$.

M6 EQ 03.A 3. Solves equations such as: $n \times 7 = 84$.

M6 EQ 04.A 4. Solves equations such as: $\frac{n}{6} = 12$.

Statistics and Graphs

1. Graphs

M6 ST 01.A Reads and interprets circle graphs.

2. Probability

M6 ST 02.A a. Understands the 0 through 1 range of probabilities and what 0 and 1 probabilities of events mean.

M6 ST 02.B b. Writes probabilities as decimals and percents.

M6 ST 02.C c. Counts arrangements using a tree diagram.

3. Sets of Data

M6 ST 03.A a. Finds the mean (average) of a set of whole numbers including decimal or fractional answers.

M6 ST 03.B b. Finds the median of a set of whole numbers.

M6 ST 03.C c. Finds the mode of a set of whole numbers.

4. Ordered Pairs

M6 ST 04.A a. Graphs ordered pairs of integers; names ordered pairs for given points (integers).

M6 ST 04.B b. Graphs a linear function (a rule for a pattern which makes a straight line).

Geometry

1. Angles and Polygons

M6 GE 01.A a. Identifies vertical angles; recognizes that vertical angles are equal.

M6 GE 01.B b. Recognizes likenesses and differences among quadrilaterals, trapezoids, and parallelograms.

M6 GE 01.C c. Identifies rectangles, squares, and rhombuses as special kinds of parallelograms.

M6 GE 01.D d. Identifies isoceles, equilateral, and scalene triangles.

2. Circles

M6 GE 02.A Constructs circles with a compass.

3. Congruency

M6 GE 03.A — Draws or copies congruent angles.

Measurement

1. Traditional

M6 ME 01.A — a. Adds two given measurements including hours and minutes.

M6 ME 01.B — b. Subtracts two measurements including hours and minutes.

2. Area (Polygons and Rectangular Solids)

M6 ME 02.A — a. Uses the formula $A = s^2$ to find areas of squares.

M6 ME 02.B — b. Uses the formula $A = bh$ to find areas of parallelograms.

M6 ME 02.C — c. Uses the formula $A = \frac{1}{2}bh$ to find areas of triangles.

M6 ME 02.D — d. Finds surface areas of rectangular solids by adding areas of the individual parts.

3. Area and Circumference (Circles)

M6 ME 03.A — a. Understands the use of 3.14 as an approximation of π.

M6 ME 03.B — b. Uses the formula $C = 2\pi r$ or $C = \pi d$ to find circumferences of circles.

M6 ME 03.C — c. Uses the formula $A = \pi r^2$ to find areas of circles.

4. Volume

M6 ME 04.A — Uses the formula $V = lwh$ to find volumes of rectangular prisms.

5. Temperature

M6 ME 05.A — a. Compares temperatures and temperature ranges in degrees Celsius, including temperatures below 0° C.

M6 ME 05.B — b. Compares temperatures and temperature ranges in degrees Fahrenheit, including temperatures below 0° F.

6. Scale Drawings

M6 ME 06.A — Finds dimensions of objects using scale drawings and scale ratios.

Money

M6 MY 01.A — Makes change by counting upwards from the cost (of an item or several items) to the amount given.

Time

M6 TE 01.A — Reads airline, bus, or train schedules.

Estimation

1. Operations

M6 ES 01.A — a. Estimates indicated sums for numbers learned at this level.

M6 ES 01.B — b. Estimates indicated differences for numbers learned at this level.

M6 ES 01.C — c. Estimates indicated products for numbers learned at this level.

M6 ES 01.D — d. Estimates indicated quotients for numbers learned at this level.

2. Measurement

M6 ES 02.A — a. Estimates fractional quantities (denominators 10 or less).

M6 ES 02.B — b. Estimates the number of square units needed to make a given area.

M6 WP 01.A

Word problems in level 6 mathematics play a most important role and should be included in teaching the majority of the objectives. Some problems may involve as many as four steps, each step built upon the preceding steps. Through solving word problems, students learn techniques for analyzing a given problem situation; choosing the correct operations leading to the solution, and estimating the solution to determine if it is, indeed, reasonable.